WORLD FOOD OUTLOOK—AN AGRIBUSINESS RESPONSE

C. F. Davan, Jr. and R. O. Aines
Director, Market Research and Development Department, and Agricultural Research Economist, International Minerals and Chemical Corporation

A short half century ago, U.S. agribusinessmen were neither concerned with nor particularly aware of farming overseas; less than a quarter of a century ago, they first became concerned with production in neighboring countries. Today, enterprising U.S. agribusinessmen are extending their horizons to encompass events all over the world and must relate those events in a meaningful fashion to their own endeavors, to adequately assist in the production of food and fiber.

THE CHALLENGE WE FACE

Today, world agribusiness operates in a realm of 3.5 billion human beings, half of whom do not have adequate diets. At present rates of growth, population is expected to increase as much in the next thirty-five years as it has since the beginning of time. In 1879, the English parson, Robert Malthus, created wide consternation with his conclusion that "the power of population is infinitely greater than the power in the earth to produce subsistence for man." But he did not foresee that a few decades later a German scientist, Justus van Liebig, would discover that certain chemicals made plants yield more life sustaining food.

Now, after great agricultural progress in some parts of the world and grim stagnation in others, the food producing power unlocked by Liebig is being challenged by the pressures of population growth. The basic problem is human reproduction versus agricultural production. The girls who will produce the multiplying billions of people to feed already exist. Consequently, if human reproduction is not to outdistance food production, it must be brought under control, and world food production must be increased.

Only some 4 percent of our world is suitable for major agriculture—about 3.5 billion acres. Most of the food supply for the entire world must be grown on this minute portion of its surface.

Historically man has increased food supply by expanding acreage under cultivation. During the past two or three decades, however,

the West has learned to expand output by economically generating rising yield per acre. Increased output through adoption of improved technology is the only long-run means of reaching the goals of adequacy for developing countries. The United Nations Interregional Seminar on Fertilizer held at Kiev, USSR, in 1965 concluded that:

> Crop production can be increased both by extending the cultivated area and by increasing crop yields per hectare of land cultivated. Extension of the cultivated area may not be possible and is generally a longer-term process involving greater capital investment than the use of fertilizers to increase yields on existing arable land. Increased crop production can be most rapidly achieved by the increased use of fertilizers and the choice of the right crop varieties for the area concerned. Increased use of fertilizers can be particularly important where water shortage limits crop output. The amount of water used per ton of crop is significantly less when fertilizers are used than when they are not used.

To help meet this need for fertilizer, the gears and workings of agribusiness must be meshed with world demand and the programs and policies of economic development and growth.

AGRIBUSINESS CAN MEET INCREASING FERTILIZER DEMAND

World fertilizer consumption began to increase in 1962 at a phenomenal rate of about 10 percent per year, which has persisted to date. A look at present production compared with projected needs of 1980 should further define the investment required to balance world fertilizer supply and demand. In 1962 the developed countries of the world consumed about 30 million tons of plant nutrients. Present production is 47 million tons, and by 1980 the economic demand will be about 113 million tons. In 1962, underdeveloped countries of the world consumed about 5 million tons of plant nutrients. Present production in these countries is 3 million tons. Forty million tons will be needed by 1980.

Existing world facilities for fertilizer production represent an investment of some $4 billion. To produce the fertilizer needed in 1980 would require a total investment of about $16 billion. At first thought, it would seem we are entering into a golden era for the fertilizer industry. But "need" does not automatically mean an "economic market." Only 112 of the world's 200 nations now use chemical fertilizers and substantial quantities of other purchased intputs. Only forty countries manufacture or process fertilizer, 75 percent of which is produced by only six countries. Thus the major volume market for world agribusiness will continue to be in the developed areas of the world for the immediate future. Even in these markets large expenditures of money and effort are required to obtain business.

If the capital required for research, development, production, and marketing is to be forthcoming from the financial sources of the world and if international agribusiness is to assume risk and apply their entrepreneurial ability, the interests and energies of all parties concerned (government, world organizations, business) must be harnessed and coordinated.

U.S. FARMING BASE FOR WORLD AGRIBUSINESS

A large part of the reaction to the world food situation by international agribusiness is necessarily a reaction to changes in U.S. agriculture. Agribusiness must gear a large part of its production and development programs to U.S. demand, a major market in which sales go a long way toward paying overhead costs for many companies.

U.S. farmers presently consume about one-fourth of all agronomic inputs (seed, pesticides, fertilizer) sold in the world. These inputs are applied to 16 percent of the world's 3.5 billion acres of arable land.

Assuming that Europe and Russia adopt sufficient technological improvements to satisfy their increasing demand for food (presently both of these areas are net importers of food), the U.S. would have to increase food production over 300 percent in order to satisfy the increasing world economic demand for food.

AGRIBUSINESS RESEARCH ON CROP TECHNOLOGY

Yield breakthroughs (500 bushel corn, 200 bushel soybeans), now considered fantastic figments of imagination by many, will require the improvement of photosynthetic efficiency. In most of our present crop production systems in the United States, photosynthetic efficiency obtained is only 2 to 2.5 percent. This simply means that practically all of the solar energy reaching the land surface is wasted. When agriculture is considered on a world-wide basis, photosynthetic efficiencies of less than 1 are very common. The efficiency in underdeveloped areas is low because of the deficiency in mineral nutrients, water, pest control, and disease control and the use of nonadaptable crops. In some of the experimental plots in the United States, especially in California, efficiencies as high as 5 percent have been achieved for part of the growing season.

At a recent IMC symposium on photosynthesis held at the IMC Growth Sciences Center, there was no suggestion by any of the 400 top world scientists present that research is on the verge of materially improving the basic photosynthetic process. But there may be ways to control respiration and improve the net production of carbo-

hydrates. Also, there are research developments which indicate that total production per acre can be materially and significantly increased without changing the basic physiology of plants. This can be done: (1) by changing the morphology or the shape of plants to intercept more light and (2) by more fully utilizing the growing season, that is, by increasing the length of the grain formation period to use more of the frost-free season for grain production. Agribusiness is working on doing these two things genetically or by chemical manipulation or a combination of both.

U.S. farmers and agribusiness working together are just now breaking away from the first yield plateau into what might be called Phase II of agricultural production. And as we look further to the future, we realize that the next yield plateau, Phase III, is already before us. But this can be reached only after we have altered the basic metabolic processes of photosynthesis. Scientists are already trying to do this and someday they will succeed. A more penetrating gaze into the crystal ball of the future shows Phase IV, which represents the reduction of CO_2 in a cell-free system—producing food in the test tube without a living plant.

AGRIBUSINESS AND "SYSTEM FARMING"

Farmers make investments for long-term profitability. They are looking for services, projections, and evaluations that will minimize their risk and maximize their returns over the years. They are looking for a total business system that includes both the physical supplies required and the business arrangements that will maximize profits. And although the supplies required and the business arrangements required to maximize profits for farmers in Zambia (Africa) and in Illinois (U.S.) may be very different in some of their particular detail, both farmers really desire and will pay for the same things —a package of the materials and services needed to increase net farm income. This in turn leads to the accomplishment of the goals of world agribussiness related to both a return on investment and an increase in world food production.

The "system approach" to business farming is rapidly expanding. The U.S. fertilizer dealer already not only sells fertilizer, but also advises on government programs, pest control, cultural practices, financing, population rates, etc.

PRIVATE-PUBLIC PARTNERSHIP REQUIRED IN AGRICULTURAL DEVELOPMENT

The relationship between the public and private sectors in world agricultural development is a critical key to much needed progress. One of the major factors contributing to the enviable success of

American agriculture has been the dominant role of the private entrepreneur and private industry in agriculture. In contrast with many less successful countries, the U.S. government has not engaged in agricultural production or in producing and distributing the multitude of inputs required by modern farming. These functions are performed by private industry.

U.S. agribusiness firms have led in the drive to apply science to farming on a broad scale. Private U.S. firms have financed and conducted more than half of the agricultural research in recent years. They are also becoming more and more active in extending new knowledge to the U.S. farmer, a function once performed entirely by the Federal Extension Service. The industry salesman or fieldman and the extension worker have become co-workers and partners in farmer technical and business education.

The large capital investment required to significantly increase per acre yields is not widely appreciated. For each acre of cropland, U.S. farmers each year purchase $50 worth of off-farm production inputs. U.S. agribusiness has the expertise—technical, management, and marketing know-how—needed to improve crop yields in the developing nations. Capital, however, from several sources, and a favorable investment climate are absolute essentials to progress.

A number of the countries of the world that are in need of increased domestic production are becoming aware of the contribution private investors can make. Countries are observing that many private companies do better than public ones. The creation of a favorable investment climate is a major responsibility of developing nations desiring the benefits of foreign private investment. A recent worldwide survey of foreign economic developments indicates that a number of countries, for example, Thailand, Indonesia, Pakistan, and several others, offer some of the needed incentives for foreign private investors such as tax holidays, guarantees of repatriation of profits and of compensation in case of expropriation, and low cost land.

Improvements in the investment climate help greatly to encourage international agribusiness to accept overseas opportunities to earn a return on investment, and, at the same time, contribute to meeting world food needs.

AGRIBUSINESS CAN INTEGRATE FARM SUPPLY, PRODUCTION, DISTRIBUTION

The step that must be accomplished by any method, program, or policy designed to facilitate economic development and increase food output is to superimpose on the land and labor available in the developing country, the complete package of materials and services

required for rapid adoption of economic technology. Two basic methods exist for achieving this end: (1) a vertically integrated farm supply, farm operating, farm sales system and (2) the more conventional system of local farmers, farm suppliers, etc.

In the developing countries, the major resources available for farm production are land and labor. Many countries lack adequate input and product distribution systems. They lack knowledge of the combination of inputs needed to achieve optimum output and profit. They lack both managerial know-how to adopt new technology and adequate credit and capital to allow for the risk and uncertainty associated with high levels of applying inputs. The bits and pieces of economic development assistance provided—loans, technical advice, research studies, demonstrations, gifts, equipment, food, seed, fertilizer—must be assimilated and fitted together into a workable whole by the economic and social complex existing in the recipient nation if rapid development is to result.

Years of experience in the relatively developed countries of the world have proved integration and coordination between some farm input industries, the farm itself, and some farm product industries to be beneficial. Thus the hypothesis, integration is one alternative economic system for organizing the total complex of food and fiber production from the basic source of farm inputs to the final consumer of farm products that would foster more rapid economic development.

A system of vertical coordination between farmers and related industries which would either supply factors of production or process farm products could provide a means of upgrading immediately the level of technology used by farmers in developing countries. In this setup, the farmer would provide the land and his labor (the two major resources that he has). The coordinating entity would: (1) determine the combination of inputs to be used with the given land and labor, (2) distribute the inputs (perhaps even apply them to the land), (3) provide working capital by taking pay for the inputs when the product was sold, (4) provide technical assistance in the production process, and (5) could even market the products. This system would bring together at minimum cost the *correct combination* of inputs required for increased output and profitability.

The coordinating entity could take any one of many possible organizational structures. It could be a farmer organization such as a cooperative, an individual company, or a consortium in an industry related to farming, a full or quasi-governmental organization, or even some combination of these.

A system involving some degree of contract farming or vertical coordination would serve as a training method in developing areas. During the period of time that the farmers were producing under the supervision of the contracting or integrating agency, they would learn to accept and apply improved technology. After the training period the farmer would be on his own. This educational method has been used both in the United States and overseas to introduce new crops and to obtain desired quantity and quality of farm production.

Some international agribusiness companies have had years of experience with integrated farm production systems (plantations) overseas. One company has indicated that its overseas operations in food production and processing produced returns that compared favorably with any other operation of the company.

On the other hand, a permanent system of complete control of farm production by vertical coordination is not practical or desirable. Some phases of the assistance needed for efficient resource organization by farmers in developing countries can undoubtedly best be furnished by governmental institutions and private industry. Qualified forward-looking private farm input suppliers with a good knowledge of the response that can be expected from their products, are in the best position to make recommendations to farmers concerning the total package of inputs for maximum profitability, which assures repeat sales. Likewise, progressive farm product processors can advise farmers concerning desirable treatment of their products.

Although organizationally an integrated farm production system offers some advantages in getting improved technology used rapidly, which results in better physical input-output ratios, and quality can be controlled more directly, there are some cost disadvantages. According to international companies that have tried both systems, labor prefers to work for the "big company," because the laborer gets higher pay and more fringe benefits. The company under many circumstances provides schools, housing, and many community services that labor has not previously enjoyed. Consequently, individual farm entrepreneurs may well have lower production costs particularly on labor intensive crops. Also, production via individual farm entrepreneurs is politically more acceptable in some developing countries.

One large international company with years of experience in agribusiness involvement overseas has now completed the cycle. Having started out with integrated farm production systems, it moved

to an associate producer system, and now is moving back to a fully integrated system as a result of losing the farm managers that had been developed over the years. As soon as the farmers got enough money they moved to the city and ran the farm with hired, lower quality management and labor.

There are many examples both in the United States and overseas of farm-related business becoming associated with farm production. The method of business organization is really a continuum varying between the two ideas being discussed: (1) a completely integrated system and (2) establishment of a marketing system to sell to or buy from individual farm entrepreneurs. IMC has projects in various stages of development that are examples of the complete range of alternative business organizations and that geographically range from India and Thailand to the Dominican Republic and Argentina, including several countries in Africa. Which method of business organization is best for a particular business environment is related to the educational and managerial quality of the farmers and the topography, among other variables. It is easier to select and train a limited number of uneducated men in an underdeveloped country to perform a managerial or operational function than to try training all; whereas, in an educated, less developed country, a mass program informing all may very well be the best way to economic development. With respect to topography, it is possible to mechanize any size of farm to an economic degree by applying appropriate size machines, but topography limits the degree to which machinery (capital) can economically be substituted for labor.

An independent private project is moving ahead in Mexico with the basic thesis that it is possible to work with small farmers in developing nations, increase production, make an adequate return with a corporate structure, and eventually turn over ownership to local interests. The project is purposely being pursued in such a way to prove or disprove the basic thesis generally, as well as with the goal of success as an individual endeavor. Final agronomic and business research and developmental work is now being completed. The sites have been selected to bring 3,000 to 5,000 hectares of land, with fragmented ownership, under management of a corporate structure that would assure the use of improved technology.

IN SUMMARY

Progressive international agribusiness is beginning to look at the enterprising farmer, world-wide, as an associate businessman. Farmers are producing proteins, fats, celluloses, and carbohydrates —all of which are processed chemicals. The proper use of chemical

raw materials is an important factor in the efficient production of these processed chemicals. Farmers are really running a chemical synthesis factory in their soil. The ultimate goal of this chemical plant operator is not just to grow a crop but to maximize returns. As a businessman and chemical plant operator he will strive to standardize production processes and to eliminate uncontrolled conditions from his operation. The commercial farmer is looking for profit-making crop and animal production systems of matched products, practices, and services that will minimize risk and maximize chances of increased and consistent returns for his efforts. It is the responsibility of governments, development organizations, and international agribusiness to work together to insure the improvement of farm production systems. International and governmental organizations concerned with economic development are now indicating, more than ever before, that they recognize the need to work more closely with international industry.

Not least among the difficulties requiring the joint efforts of all entities concerned with economic development is the conflict between the goals of optimum regional economic development and of each country's desires for increased domestic production. Many of the production operations of modern industry such as chemical fertilizer mines and plants have very significant economies of scale. Yet the individual developing country cannot generate sufficient demand to consume the output of a large, efficient plant. The alternatives are: (1) to build a smaller, less efficient plant that puts a higher cost product on the market, which results in lower demand than would exist for a lower cost product, or (2) build a large plant and increase risk by gambling on export sales, many of which will be restricted by high import duties or licensing requirements of the importing nation. One partial answer to the dilemma is regional development of interdependent plants with both countries supplying some of the plant's inputs and both countries agreeing to buy some of the output of the other country's plant.

IMC has attempted, with limited success, to work out some of these proposals. However, the possibilities of success should be much greater for a broad international entity, dedicated to integrated regional planning of economic development but with a realistic business orientation. A "Manhattan Project" built the atomic bomb, and an "Apollo Project" is to put man on the moon. Surely it is possible to create a superstructure that can effectively apply the energies and capabilities of international agribusiness, interested organizations, and governments to improve the world food situation over what it otherwise would be.